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TITLE

ACCURACY OF APPRAISING NEEDLE COMPLEMENT PER TWIG AND NEEDLE LENGTH ON PONDEROSA PINE

by
Noel D. Wygant
Berkeley, California
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SUBJECT—

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Forest Insect Laboratory
Berkeley, California
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ACCURACY OF APPRAISING NEEDLE COMPLEMENT PER TWIG AND NEEDLE LENGTH ON PONDEROSA PINE.

APPROVED BY:

J. M. MILLER
Senior Entomologist, in Charge

SUBMITTED BY:

N. D. WYGANT
Assistant Entomologist

ACCURACY OF APPRAISING NEEDLE COMPLEMENT PER TWIG AND NEEDLE LENGTH ON PONDEROSA PINE

The study of the physical characteristics of high and low risk ponderosa pines at the Black's Mountain Experimental Forest during the summer of 1941 afforded the opportunity of determining the accuracy of estimating two characters used in rating risk. In this study[1] six physical characters were measured on high and low risk trees to determine wherein the classes differed. Before the trees were felled to obtain the measurements, the risk characters were appraised by J. W. Bongberg and in some cases by J. W. Johnson. The object of this memorandum is to show how well the appraisal of needle complement and needle length agreed with empirical values set up for these characters.

Appraisals and measurements were made on 16 risk 1, 17 risk 2, and 17 risk 4 trees, a total of 50 trees. A summary of the measurements showed that the differences between the averages of risk 1 and risk 4 trees were very highly significant. However, any given character varied widely within a given risk group.

Crown Density: Crown density as it applies to risk rating has been considered as essentially needle complement per twig. Under the present system of risk rating, three categories of crown density are used --dense, medium, and thin. On the basis of the number of needle fascicles per twig on the 50 trees analyzed, the empirical values for these categories have been arbitrarily selected as follows: Dense, 175 or more fascicles per twig; medium, 125 to 175 fascicles per twig; and thin, 125 or less fascicles per twig. Using these values, the accuracy of appraisal would be as shown in table 1. The appraisal was carried on 67 of the cases or an accuracy of 68 percent. The crown density was appraised both in top and mid crown which gives a total of 98 cases on 49 trees. One risk 4 tree was not used because the appraisal was made 2 years before the tree was felled and analyzed and apparently the crown characters had materially changed during this period.

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[1] Wygant, N. D., 1942. Studies of physical characteristics of high and low risk ponderosa pines, Black's Mountain Experiemental Forest, Season of 1941. Office report, Berkeley, California, May 26, 1942.

Table 1.-- Accuracy of Appraising Crown Density

	Trees with Dense Complements were Appraisal as Follows			Trees with Medium Complements Were Appraised As Follows			Trees With Thin Comp. Were Appraised as Follows		Percent Accuracy
Risk 1	Dense	Med.	Thin	Dense	Med.	Thin	Med.	Thin	
Top Crown	8	2		1	5				81
Mid Crown	6	4		1	5				69
Risk 2									
Top Crown	7	1	1	1	4	1	1	1	75
Mid Crown	3	3		2	7	1	1		59
Risk 4									
Top Crown		2	1		2	1	2	8	63
Mid Crown		2	1		1	1	1	10	69
All Risks	24	14	3	5	24	4	5	19	68

Needle Length: Under the present system of appraisal of crown characters for risk rating, needle length is classified as long, medium, or short. Using the data from the study on physical characters of high and low risk ponderosa pines, the values for these classes would be about as follows: Long, 6 inches or more in length; medium, 5 to 6 inches in length; and short, less than 5 inches in length. The average needle length on any one-third of the crown of the 50 trees varied from 7.33 inches on a risk 2 tree to 3.67 inches in length on a risk 4 tree. The average needle length of the risk 1 trees was 6.22 inches in top crown and 6.47 inches in mid crown. The average needle length of the risk 4 trees was 4.91 inches in top crown and 4.96 inches in the mid crown.

Applying the three categories determined from measurement to the appraisals, the accuracy would be as shown in table 2. The appraisals were correct in 64 cases out of 100 or an accuracy of 64 percent. The accuracy on risk 1 trees was good, but on the risk 4 trees, particularly in top crown, accuracy was little better than chance.

Table 2. --Accuracy of Appraising Needle Length

	Trees with Long Needles were Classed as Follows:		Trees with Medium Needles were Classed as Follows:			Trees with short Needles were classed as Follows:		Percent Correct
	Long	Med.	Long	Med.	Short	Medium	Short	
Risk 1								
Top Crown	8	3	2	3				69
Mid Crown	11	2		3				88
Risk 2								
Top Crown	7	2	2	4		1	1	71
Mid Crown	8	2	2	4	1			71
Risk 4								
Top Crown		1	1	2	4	4	5	41
Mid Crown		1	2	4	3	3	4	47
All Risks	34	11	9	20	8	8	10	64

Discussion: This study does not discredit the risk classification, because on a practical basis the classification has worked very well. It seems to show that estimates of needle length are subject to much error. In such an interpretation of the data, however, it must be recognized that comparison of appraisals with empirical classes that intergrade from one to the next is subject to criticism. To compensate in some measure for this, when actual measurement of either of the two characters placed a tree near the borderline between two categories, the benefit of the doubt was always given to the appraisal. A second criticism of making such a comparison is the fact that the twigs that were used as samples may or may not have been representative in all cases of the areas of the crown upon which the observer based his appraisal. The accuracy does show that an appraisor can recognize differences in needle complement and needle length on many trees but not on all. One of the probable causes of error on certain trees is the bias caused by the amount of foliage on a tree. In comparing photographs of the trees before they were felled with the measurements and estimates, there are strong indications that needle complement and needle length of a given class is apt to look better on a full, thick crown than on a

thin-crowned tree into which and through light can pass. Trees with small thin crowns often have better needle complement and needle length than trees with full thick crowns. A second contributing factor perhaps may be that the appraisor is influenced in estimating needle length and needle complement by his general impression of the vigor of the tree.